

REMARKS

This application has been reviewed in light of the final Office Action dated January 24, 2006. In view of the foregoing amendments and the following remarks, favorable reconsideration and withdrawal of the objection and rejections set forth in the Office Action are respectfully requested.

Claims 1-11 are pending, with Claims 6-10 having been withdrawn from consideration as being directed to a non-elected invention. Claims 1, 2, 5 and 11 have been amended. Support for the claim changes can be found in the original disclosure, and therefore no new matter has been added. Claims 1, 5, 6, 8, 10 and 11 are in independent form.

The drawings were objected to as not showing the “film-like region” recited in the claims. Without conceding the propriety of this objection, the claims have been amended to delete the term “film-like.” Withdrawal of this objection is respectfully requested.

Claims 1-5 and 11 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, on account of the term “film-like” recited therein. Without conceding the propriety of this rejection, the claims have been amended to delete the term “film-like,” as noted. Withdrawal of this rejection is respectfully requested.

Claims 1-4 and 11 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,060,735 (*Izuha et al.*).

Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over *Izuha et al.* in view of U.S. Patent No. 6,398,349 (*Murai*).

Applicants respectfully traverse the prior art rejections.

Applicants submit that independent Claims 1, 5 and 11 are patentable over the cited art for at least the following reasons.

Independent Claim 1 recites, *inter alia*, “wherein a region where crystals of said lower electrode and/or said upper electrode and crystals of said piezoelectric film are mixed exists between said lower electrode and/or said upper electrode and said piezoelectric film.” Each of independent Claims 5 and 11 recites the same language.

Izuha et al. relates to a thin film dielectric device including a lower electrode, a dielectric thin film, and an upper electrode. According to *Izuha et al.*, lower electrode 4 is composed of crystal grains (columnar grains) a, dielectric film 5 is composed of crystal grains b, and upper electrode 6 is composed of crystal grains c, as shown in Fig. 4A. Col. 5, lines 7-21. Grains b “successively grow” from grains a and “take over the crystal orientation” of grains a. Col. 5, lines 10-14. Likewise, grains c “successively grow” from grains b and “take over the crystal orientation” of grains b. Col. 5, lines 14-18. The crystal grains of the dielectric thin film are grown epitaxially on the crystal grains of the lower electrode, and the crystal grains of the upper electrode are grown epitaxially on the crystal grains of the dielectric thin film. See, e.g., col. 3, lines 13-40. In addition, the lattice constants of the grains of the dielectric thin film are substantially matched with the lattice constants of the grains of the lower electrode at the interface between the dielectric thin film and the lower electrode, and the lattice constants of the grains of the upper electrode are substantially matched with the lattice constants of the grains of the dielectric thin film at the interface between the upper electrode and the dielectric thin film. Col. 5, lines 38-49.

In view of the structure of *Izuha et al.*'s thin film dielectric device as described above, nothing in that document is seen that would teach or suggest the claimed "region where crystals of said lower electrode and/or said upper electrode and crystals of said piezoelectric film are mixed [that] exists between said lower electrode and/or said upper electrode and said piezoelectric film."

As explained above, the crystal grains of each successive layer (i.e., lower electrode 4, dielectric thin film 5, and upper electrode 6) of *Izuha et al.*'s structure are grown (deposited) epitaxially on the crystals of the preceding (underlying) layer. Thus, while crystal grains b (of the dielectric thin film) share certain aspects of their crystal structure with crystal grains a (of the lower electrode), crystal grains b are different from crystal grains a (and likewise for crystal grains c and b). For example, crystal grains b and crystal grains a are understood to have the same unit cell (lattice structure) and orientation as a concomitant of the epitaxial growth. However, the lattice constants (the lengths of the unit cell along the x, y, and z (a, b, and c) axes, which define the distance between atoms in the lattice) of crystal grains b are not necessarily identical to the lattice constants of crystal grains a. *Izuha et al.*'s invention aims to make the lattice constants of the crystal grains of the different layers relatively close to another, e.g., having a mismatch of 15% or less, 5% or less, or 2.5% or less. Col. 7, lines 1-25.

Accordingly, in *Izuha et al.* the columnar (crystal) grains of different layers are said to be "continuous" by virtue of sharing certain aspects of crystal structure. See, e.g., col. 3, line 11. It is also said in that document that the bottom electrode and the dielectric thin film "share each column at the interface" thereof. Col. 3, line 11-13; emphasis added. However,

the different layers do not share columnar (crystal) grains, as alleged in the Office Action (page 4). Each layer has its own columnar (crystal) grains: lower electrode 4 has grains a, dielectric thin film has grains b, and upper electrode 6 has grains c. Crystal grains a differ from crystal grains b, e.g., in respect of their lattice constants (and likewise for crystal grains b and crystal grains c). “The columnar grains A [cited by the Office Action as being shared among the different layers] are [actually] composed of [three separate groups:] crystal grains a, b and c,” each of which groups is successively grown upon the previous group. Col. 5, lines 24-25.

Accordingly, nothing in *Izuha et al.* is seen to teach or suggest a region, existing between an electrode and the dielectric thin film, in which crystals of the electrode and crystals of the dielectric thin film are mixed.

Murai is cited by the Office Action (page 5) as teaching an ink jet printing head comprising a pressure chamber, nozzle, diaphragm and ink. Even if *Murai* be deemed to teach what the Office Action alleges it does, nothing in that document is understood to compensate for the above-discussed deficiencies of *Izuha et al.* with respect to independent Claims 1, 5 and 11.

Since neither *Izuha et al.* nor *Murai* contains all of the elements of any of independent Claims 1, 5 and 11, those claims are believed to be allowable over those documents.

A review of the other art of record has failed to reveal anything which, in Applicants’ opinion, would remedy the deficiencies of the art discussed above, as references

against independent Claims 1, 5 and 11. Independent Claims 1, 5 and 11 are therefore believed patentable over the art of record.

The other claims presented for examination are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each of these dependent claims is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

Applicants submit that this Amendment After Final Rejection clearly places the subject application in condition for allowance. This Amendment was not presented earlier, because Applicants believed that the prior Amendment placed the subject application in condition for allowance. Accordingly, entry of the instant Amendment, as an earnest attempt to advance prosecution and reduce the number of issues, is requested under 37 C.F.R. § 1.116.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

THIRD REQUEST FOR ACKNOWLEDGMENT OF GENERIC CLAIMS

Applicants filed a Response to Restriction and Election of Species Requirement on October, 22, 2004. In that paper, Applicants set forth arguments to the effect that Claim 1, 5 and 11 are generic to all the species. However, Applicants have received neither a response to those arguments nor an acknowledgment of generic claims. Accordingly, Applicants respectfully request consideration of those arguments and acknowledgment that Claim 1, 5 and 11 are generic to all the species.

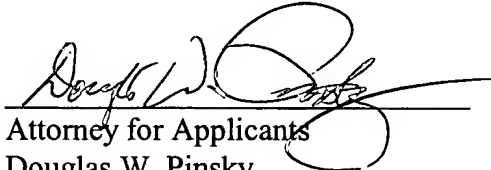
(Applicants note that this request was made in each of the last two Amendments, filed on May 23, 2005 and November 10, 2005, respectively, but no response thereto has been received.)

REQUEST FOR CONSIDERATION OF PREVIOUSLY-FILED IDS

Applicants filed a Third Supplemental Information Disclosure Statement on January 18, 2006. Applicants understand that the Examiner may not have received that Information Disclosure Statement prior to issuing the instant final Office Action. Applicants respectfully request that the Examiner return an initialed copy of the Form PTO-1449 from that Information Disclosure Statement indicating that the information cited therein has been considered.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



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